In the Claims:

1-2. (Cancelled)

3. (Currently amended) The method of Claim [[2]] 4, wherein located at each collocation point tj is a value of u(tj), respectively, to be interpolated with polynomials.

4. (Currently amended) A ~~The~~ method of ~~Claim 2~~ simulating a circuit, the method comprising:

defining a differential-algebraic equation of the circuit;

defining a simulation time interval corresponding to the differential-algebraic equation;

dividing the simulation time interval into time intervals, wherein the time intervals have corresponding polynomials for each time interval, wherein each polynomial is a portion of an approximation to a desired solution of the differential-algebraic equation; and

applying a collocation method to discretize the differential-algebraic equation;

wherein:

the simulation time interval has collocation points, and wherein the interpolating polynomial has a degree of M;

the approximation to the desired solution of the differential-algebraic equations is $I_M u(t) = \sum_{k=0}^{M} \tilde{u}_k T_k(t),$ wherein M is the highest degree of the interpolating polynomials.

5. (Currently amended) A ~~The~~ method of ~~Claim 4~~ simulating a circuit, the method comprising:

defining a differential-algebraic equation of the circuit;

defining a simulation time interval corresponding to the differential-algebraic equation;

dividing the simulation time interval into time intervals, wherein the time intervals have corresponding polynomials for each time interval, wherein each polynomial is a portion of an approximation to a desired solution of the differential-algebraic equation; and

applying a collocation method to discretize the differential-algebraic equation;

wherein:

the simulation time interval has collocation points, and wherein the interpolating polynomial has a degree of M;

the approximation to the desired solution of the differential-algebraic equations is $I_M u(t) = \sum_{k=0}^{M} \tilde{u}_k T_k(t),$ wherein M is the highest degree of the interpolating polynomials; and

a derivative of the approximation is $(I_M u)'(t) = \sum_{k=0}^{M} \tilde{u}'_k T_k(t).$

6. (Original) The method of Claim 5, wherein each coefficient ũ'k is computed from ũk.

7. (Currently Amended) The method of Claim [[1]] 5, wherein the circuit is a radio frequency (RF) circuit.

8. (Currently amended) The method of Claim [[1]] 4, wherein the step of applying a collocation method comprises applying Chebyshev collocation to discretize the set of differential-algebraic equation.

9. (Cancelled)

10. (Currently amended) The method of Claim [[9]] 19, wherein the set of differential-algebraic equations comprises at least one of: a set of initial-value differential-algebraic equations and a set of boundary-value differential-algebraic equations.

11. (Currently amended) The method of Claim [[9]] 20, wherein the circuit simulation is a radio frequency (RF) circuit simulation.

12. (Currently amended) The method of Claim [[9]] 20, wherein the step of applying a collocation method comprises applying Chebyshev collocation to each differential-algebraic equation to discretize the set of differential-algebraic equations.

13. (Cancelled)

14. (Currently amended) The method of Claim [[13]] 19, further comprising enforcing continuity of the solution at the boundary of neighboring intervals.

15. (Currently amended) The method of Claim [[9]] 20, wherein the set of differential-algebraic equations comprises a set of boundary-value differential-algebraic equations, and wherein the boundary-value differential-algebraic equations include a first and a last interval.

16. (Original) The method of Claim 15, further comprising enforcing a boundary condition at a boundary of the first and the last interval.

17. (Currently amended) The method of Claim [[13]] 20, further comprising:

solving the set of differential-algebraic equations using a Newton-Raphson iterative method; and

in each Newton-Raphson step of the Newton-Raphson iterative method, solving a linear Jacobian system using a linear iterative method.

18. (Cancelled)

19. (Currently amended) A ~~The~~ method of ~~Claim 18~~ solving a set of differential-algebraic equations arising in a circuit simulation, the method comprising:,

applying a collocation method to each differential-algebraic equation to discretize the set of differential-algebraic equations;

forming a solution to the set of differential-algebraic equations based on the discretized differential-algebraic equation; and

determining an order of accuracy desired in each interval;

wherein:

the set of differential-algebraic equations comprises a set of boundary-value differential-algebraic equations, and wherein the boundary-value differential-algebraic equations are discretized in intervals, and wherein neighboring intervals share a boundary; and

the solution in a particular interval is smooth, and wherein the step of determining the order of accuracy desired in each interval comprises determining whether to increase the order of accuracy of the particular interval.

20. (Currently amended) A ~~The~~ method of ~~Claim 18~~ solving a set of differential-algebraic equations arising in a circuit simulation, the method comprising:,

applying a collocation method to each differential-algebraic equation to discretize the set of differential-algebraic equations;

forming a solution to the set of differential-algebraic equations based on the discretized differential-algebraic equation; and

determining an order of accuracy desired in each interval;

wherein:

the set of differential-algebraic equations comprises a set of boundary-value differential-algebraic equations, and wherein the boundary-value differential-algebraic equations are discretized in intervals, and wherein neighboring intervals share a boundary; and

the solution in a particular interval is not smooth, and wherein the step of determining the order of accuracy desired in each interval comprises splitting the particular interval into at least two subintervals.

21. (Original) The method of Claim 17, further comprising separately approximating for each interval a local preconditioner.

22. (Original) The method of Claim 21, wherein the local preconditioner comprises at least one of:

a capacitance matrix; and

a conductance matrix.

23. (Cancelled)

24. (Currently amended) The computer-readable medium of Claim [[23]] 34, wherein the set of differential-algebraic equations comprises at least one of: a set of initial-value differential-algebraic equations and a set of boundary-value differential-algebraic equations.

25. (Currently amended) The computer-readable medium of Claim [[23]] 34, wherein the circuit simulation is a radio frequency (RF) circuit simulation.

26. (Currently amended) The computer-readable medium of Claim [[23]] <u>34</u>, wherein the step of applying a collocation method further causes the processor to carry out the step applying Chebyshev collocation to each differential-algebraic equation to discretize the set of differential-algebraic equations.

27. (Cancelled)

28. (Currently amended) The computer-readable medium of Claim [[27]] <u>34</u>, wherein the instructions further cause the processor to carry out the step of enforcing continuity of the solution at the boundary of neighboring intervals.

29. (Currently amended) The computer-readable medium of Claim [[23]] <u>34</u>, wherein the set of differential-algebraic equations comprises a set of boundary-value differential-algebraic equations, and wherein the boundary-value differential-algebraic equations include a first and a last interval.

30. (Original) The computer-readable medium of Claim 29, wherein the instructions further cause the processor to carry out the step of enforcing a boundary condition at a boundary of the first and the last interval.

31. (Currently amended) The computer-readable medium of Claim [[27]] <u>34</u>, wherein the instructions further cause the processor to carry out the steps of:

solving the set of differential-algebraic equations using a Newton-Raphson iterative method; and

in each Newton-Raphson step of the Newton-Raphson iterative method, solving a linear Jacobian system using a linear iterative method.

32. (Cancelled)

33. (Currently amended) A ~~The~~ computer-readable medium ~~of Claim 32,~~ carrying one or more sequences of one or more instructions for solving a set of differential-algebraic equations arising in a circuit simulation, the one or more sequences of one or more instructions including instructions which, when executed by one or more processors, cause the one or more processors to perform the steps of:

applying a collocation method to each differential-algebraic equation to discretize the set of differential-algebraic equations; and

forming a solution to the set of differential-algebraic equations based on the discretized differential-algebraic equation;

wherein:

the set of differential-algebraic equations comprises a set of boundary-value differential-algebraic equations, and wherein the boundary-value differential-algebraic equations are discretized in intervals, and wherein neighboring intervals share a boundary;

the instructions further cause the processor to carry out the step of determining an order of accuracy desired in each interval; and

the solution in a particular interval is smooth, and wherein the step of determining the order of accuracy desired in each interval further causes the processor to carry out the step of determining whether to increase order accuracy of the particular interval.

34. (Currently amended) A ~~The~~ computer-readable medium ~~of Claim 32,~~ carrying one or more sequences of one or more instructions for solving a set of differential-algebraic equations arising in a circuit simulation, the one or more sequences of one or more instructions including instructions which, when executed by one or more processors, cause the one or more processors to perform the steps of:

applying a collocation method to each differential-algebraic equation to discretize the set of differential-algebraic equations; and

forming a solution to the set of differential-algebraic equations based on the discretized differential-algebraic equation;

wherein:

the set of differential-algebraic equations comprises a set of boundary-value differential-algebraic equations, and wherein the boundary-value differential-algebraic equations are discretized in intervals, and wherein neighboring intervals share a boundary;

the instructions further cause the processor to carry out the step of determining an order of accuracy desired in each interval; and

the solution in a particular interval is not smooth, and wherein the step of determining the order of accuracy desired in each interval further causes the processor to carry out the step of splitting the particular interval into at least two subintervals.

35. (Original) The computer-readable medium of Claim 31, wherein the instructions further cause the processor to carry out the step of separately approximating for each interval a local preconditioner.

36. (Original) The computer-readable medium of Claim 35, wherein the local preconditioner comprises at least one of:

a capacitance matrix; and

a conductance matrix.

37. (New) A method of simulating an rf circuit, comprising the steps of:

determining a plurailty of differential equations describing operation of the rf circuit;

determining a set of Chebyshev Gauss-Lobatto collocation points for the plurality of differential equations, producing a set of intervals;

discretizing each of the differential equations based on the Chebyshev Gauss-Lobatto collocation point intervals;

solving the differential equations in each of the intervals; and

simulating the rf circuit based on the solved intervals.

38. (New) The method according to Claim 37, wherein the step of solving comprises applying a set of at least one high order solution to at least one of the intervals and applying at least one solution from a set of low order solutions to a plurality of the intervals.

39. (New) The method according to Claim 37, wherein the step of solving comprises applying a set of solutions comprising more low order solutions than high order solutions.

40. (New) The method according to Claim 37, further comprising the steps of:

dividing the intervals into smooth and non-smooth categories,

applying higher order solutions to the smooth category intervals, and

applying lower order solutions to the non-smooth category intervals.

41. (New) The method according to Claim 37, wherein the Chebyshev Gauss-Lobatto collocation points produce a small number of intervals in areas in which the differential equations exhibit high convergence, and a large number of intervals in areas where the differential equations exhibit low convergence.

42. (New) The method according to Claim 37, wherein the step of solving comprises applying higher order solutions in smooth intervals and applying lower order solutions in less smooth intervals.

43. (New) The method according to Claim 37, further comprising the steps of:

enforcing continuity of the solution at each interval boundary; and

enforcing a periodic boundary condition at each first and last interval boundaries.

44. (New) A method of simulating response in a circuit, comprising the steps of:

determining a plurality of differential equations describing operation of the circuit;

determining a set of collocation points for the plurality of differential equations, producing a set of intervals comprising at least one high convergence interval and a plurality of low convergence intervals;

applying a higher order solution in the at least one high convergence interval;

applying a lower order solution in the low convergence intervals; and

simulating the circuit response using the higher and lower order solutions.

45. (New) The method according to Claim 44, wherein the collocation points comprise Chebyshev Gauss-Lobatto collocation points.

46. (New) The method according to Claim 44, further comprising the steps of:

enforcing continuity of the solutions at each interval boundary; and

enforcing a periodic boundary condition at each first and last interval boundaries.

47. (New) The method according to Claim 44, further comprising the steps of:

enforcing continuity of the solutions at each interval boundary; and

enforcing a periodic boundary condition at at least one of the first and last interval boundaries.

48. (New) The method according to Claim 44, wherein more low order solutions are applied to the differential equations than high order solutions.